APPENDIX

Computer Programs and Sample Run

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∇NORM[□]∇
[0]    X←NORM N;Z;T;R
[1]    ⍝ ;;
[2]    ⍝ 961204.1712
[3]    ⍝ GENERATE N NORMAL RANDOM VARIABLES, MEAN 0, SIGMA 1
[4]    ⍝ □RL IS SEED
[5]    Z←2,⌈N÷2
[6]    Z←Zρ(÷10000)×?(×/Z)ρ10000
[7]    T←(○2)×Z[1;]
[8]    R←(-2×⍟Z[2;])*0.5
[9]    X←N↑,(1 1∘.×R)×2 1∘.○T
    ∇ 1996-12-10 11.00.01 (GMT-4)


       ∇DELRES[□]∇
[0]    R←Y DELRES X;N;I
[1]    ⍝ ;;
[2]    ⍝ 000323.2241
[3]    ⍝ DELAY RESIDUALS
[4]    N←ρX
[5]    R←0×Y
[6]    R[⍳N]←Y[⍳N]
[7]    I←0
[8]    NEXTI:I←I+1
[9]    R[N+I]←Y[N+I]-R[N+I-⍳N]+.×X
[10]   →NEXTI×⍳I<(ρY)-N
[11]   R←N↓R
    ∇ 2000-03-25 22.51.47 (GMT-4)


       ∇NLS[□]∇
[0]    XE←XD NLS RES;X;∆X;R;P;J;∆R;A;B;D;EM;E;I;EE;AA
[1]    ⍝ ;RES;
[2]    ⍝ 800225.0914 800820 000321.1532
[3]    ⍝ NONLINEAR LEAST SQUARES
[4]    ⍝ CHAR. VECT. RES IS RESIDUAL FUNCTION NAME
[5]    X←XD[1;]
[6]    ∆X←XD[2;]
[7]    EE←''
[8]    I←0
[9]    NEXTI:I←I+1
[10]   R←⍎RES,' X'
[11]   ⍝ (R A B)←⍎RES,'(X ∆X)'
[12]   ⍝ EE←EE,(÷/+/(R*2),[0.5]1)*0.5
[13]   (÷/+/(R*2),[0.5]1)*0.5
[14]   ⍝ ANALYTIC RESIDUAL PARTIALS
[15]   ⍝ P←⍎(RES,'P'),' X'
[16]   ⍝→ANPAR
[17]   ⍝ CALCULATE R, A AND B
[18]   ⍝ (R A B)←⍎RES,'(X ∆X)'
[19]   ⍝ →CALCRAB
[20]   ⍝ NUMERIC RESIDUAL PARTIALS
[21]   P←''
[22]   J←0
[23]   NEXTJ:J←J+1
[24]   ∆R←(⍎RES,' X+∆X[J]×J=⍳ρX')-R
[25]   P←P,∆R÷∆X[J]
```

11

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[26]    →NEXTJ×ιJ<ρX
[27]    P←⍉((ρX),(ρP)÷ρX)ρP
[28]  ANPAR:A←(⍉P)+.×P
[29]    B←(⍉P)+.×R
[30]  CALCRAB:
[31]    D←÷(((0 1+ρA)ρA)[;1]+1E¯10)*0.5
[32]    AA←(A×D∘.×D)+1E¯10×(ρA)ρ1,0×A
[33]    X←X-D×(D×B)⌹AA
[34]    →NEXTI×ιI<3
[35]    R←⍎RES,' X'
[36]  ⍝ (R A B)←⍎RES,'(X ΔX)'
[37]    EM←÷/+/R,[0.5]1
[38]    E←(÷/+/(R*2),[0.5]1)*0.5
[39]    XE←(X,EM),[0.5]E×(((0 1+ρAA)ρ(D∘.×D)×⌹AA)[;1],1)*0.5
[40]  ⍝ EE,E
[41]    E
[42]  ⍝ ' '
[43]  ⍝ XE
[44]  ⍝ →NEXTI×ιI<20
[45]  ⍝ RR←R
     ∇ 2000-03-29 23.00.55 (GMT-4)


      ∇NLS[☐45]
[45]  ⍝ RR←R
[45]    RR←R
[46]  ∇


      ρX5←NORM 100000
100000
      ☐←S←(÷/+/((X5)*2),[.5]1)*.5
1.002357739
      ρXX5←X5[3+ι99997]+.1×X5[(ι99997)∘.+¯1+ι4]+.×1 0 1 0
99997
      ☐←N←(÷/+/((XX5-3↓X5)*2),[.5]1)*.5
0.1418755036
      20×10⍟S÷N
16.98230664
      (2 3ρ0 0 0 .001 .001 .001)NLS 'XX5 DELRES'
1.011856929
1.002412348
1.00237057
1.002370568
0.09896411424  0.001084301862 0.09780701046  0.008745036907
0.003147221067 0.003163105505 0.003146911359 1.002370568
      ☐←N←(÷/+/((RR-6↓X5)*2),[.5]1)*.5
0.002841730873
      20×10⍟S÷N
50.94879605
```